

WHAT IS CLAIMED IS:

1. An outline forming apparatus comprising:

memory means for storing, with regard to each control-point for forming an outline of a pattern having a prescribed thickness, position information based upon the position of each control-point and movement information based upon a path of movement of each control-point that accompanies a change in weight at the time of outline generation;

input means for entering designating information that designates a pattern to be generated and weight at the time of outline generation of said pattern;

acquisition means which, with regard to each control-point for forming the outline of the pattern designated by said designating information, is for acquiring the position of said each control-point that prevails when an outline is generated in the weight designated by the designating information, based upon the position information and movement information; and

outline generating means for generating an outline of a pattern based upon the position of said each control-point acquired by said acquisition means.

2. The apparatus according to claim 1, wherein:

said memory means stores, together with position information of each control-point forming an outline of a prescribed thickness, and with regard to an control-point that moves in conformity with the weight of an

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output pattern, movement information relating to path of movement of this control-point and absence/presence information indicating absence/presence of movement information at each control-point, these items of
5 information being stored for each control-point; and

said acquisition means acquires, with regard to an control-point judged to have movement information from said absence/presence information from among each of the control-points forming a pattern designated by said
10 designating information, the position of said control-point, which prevails when the outline is generated in the weight designated by said designating information, based upon said position information and said movement information, and acquires, with regard to an control-
15 point judged to have no movement information, position information of said control-point stored in said memory means, as the position of said control-point at the time of formation of a pattern outline.

3. The apparatus according to claim 1, wherein:

20 said memory means stores, as movement information, and for each control-point, position information of each control-point forming an outline of a prescribed thickness and information for obtaining a function representing a path of movement of each control-point
25 that accompanies a change in weight at the time of outline generation; and

said acquisition means acquires, with regard to

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each control-point of a pattern designated by said designating information, position at the time of outline generation at a weight designated by said designating information, this position being acquired using a function obtained based upon said position information and said movement information.

4. The apparatus according to claim 1, wherein:

said memory means stores position information of each control-point forming an outline of a prescribed thickness and movement information for obtaining a function representing a path of movement of each control-point that accompanies a change in weight at the time of outline generation, these items of information being stored in variable length in dependence upon the degree of said function, and stores degree information, which represents the degree of said function, for each control-point; and

said acquisition means acquires, with regard to each control-point of a pattern designated by said designating information, position at the time of outline generation at a weight designated by said designating information, this position being acquired using a function obtained based upon said position information and said movement information.

5. The apparatus according to claim 3, wherein:

said input means enters quality designating information, which is for designating quality at the

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time of formation of a pattern outline, together with said designating information; and

5 in a case where low quality is designated by said quality designating information, said acquisition means lowers the degree of the function representing the path of movement used, and acquires position information, which prevails at the time of outline generation, representing the position of the control-point at the time of outline generation.

10 6. The apparatus according to claim 3, wherein:

said input means enters generation-speed designating information, which is for speed at the time of formation of a pattern outline, together with said designating information; and

15 in a case where high speed is designated by said generation-speed designating information, said acquiring means lowers the degree of the function representing the path of movement used, and acquires position information, which prevails at the time of outline generation, representing the position of the control-point at the time of outline generation.

20 7. An outline forming apparatus comprising:

memory means for storing, with regard to each control-point for forming an outline of a pattern having a prescribed weight, and for each control-point, position information based upon the position of each control-point, and storing a first standard width

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indicating a standard width of the pattern of said prescribed weight, and a second standard width indicating a standard width of a pattern of an outline having maximum weight;

5 input means for entering designating information that designates a pattern to be generated and weight at the time of outline generation of said pattern;

 setting means for performing ranking of amounts of movement, in which a difference between said first
10 standard width and said second standard width serves as a reference, with regard to a movable amount of each control-point detected from a mutual positional relationship between control-points that form the pattern designated by said designating information, and
15 setting an amount-of-movement rank of each control-point;

 generating means for generating, with regard to each control-point, movement information of said control-point based upon the amount-of-movement rank of
20 the control-point and an amount-of-movement rank of an control-point of a pair that decides pattern width at the position of said control-point;

 acquisition means for acquiring, based upon said position information and said movement information, the
25 position of said each control-point that prevails when an outline is generated in a thickness designated by said designating information; and

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outline generating means for generating an outline of a pattern based upon position at the time of outline generation acquired by said acquisition means.

8. The apparatus according to claim 7, wherein said
5 generating means obtains, with regard to said each control-point, the position of an control-point in a pattern of maximum weight based upon amount-of-movement rank of the control-point and an amount-of-movement rank of an control-point of a pair that decides pattern width
10 at the position of said control-point, and generates movement information representing path of movement of said control-point, in which weight of the pattern serves as a parameter, based upon said position and said position information.

9. The apparatus according to claim 7, wherein the
15 pattern of the outline of a prescribed weight stored in said memory means is a pattern of an outline of maximum fineness.

10. The apparatus according to claim 7, wherein said
20 memory means stores, with regard to each control-point for forming an outline of a pattern having a prescribed weight, and for each control-point, position information based upon the position of an control-point, and stores a first standard width indicating a standard width of
25 the pattern of said prescribed weight, and a second standard width indicating a standard width of a pattern of an outline having maximum fineness.

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11. The apparatus according to claim 10, wherein the pattern of the outline of a prescribed weight stored in said memory means is a pattern of an outline of maximum weight.

5 12. The apparatus according to claim 7, wherein said generating means has an amount-of-movement table storing a predetermined amount of movement for every combination of amount-of-movement ranks, obtains an amount of movement of said control-point by searching said amount-
10 of-movement table based upon a combination of the amount-of-movement rank of said control-point and an amount-of-movement rank of an control-point of a pair that decides pattern width at the position of said control-point, and generates movement information of
15 said control-point based upon said amount of movement.

13. An outline forming apparatus comprising:

memory means for storing, with regard to each control-point for forming an outline of a pattern having a prescribed thickness, and for each control-point,
20 position information based upon the position of an control-point and movement information based upon a path of movement of the control-point that accompanies a change in weight at the time of outline generation, and, in a case where said movement information changes with a
25 certain weight serving as a boundary, storing weight information indicating a weight which serves as the boundary and movement information after the change;

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input means for entering designating information that designates a pattern to be generated and weight at the time of outline generation of said pattern;

5 selecting means for selecting, with regard to each control-point that forms the pattern designated by said designating information, selects movement information to be used based upon the thickness designated by said designating information and said weight information;

10 acquisition means which, with regard to said each control-point, is for acquiring the position of said each control-point that prevails when an outline is generated in the weight designated by said designating information, based upon said position information and the movement information selected by said selecting
15 means; and

outline generating means for generating an outline of a pattern based upon position at the time of outline generation acquired by said acquisition means.

14. An outline forming method comprising:

20 a storing step of storing, with regard to each control-point for forming an outline of a pattern having a prescribed thickness, position information based upon the position of each control-point and movement information based upon a path of movement of each
25 control-point that accompanies a change in weight at the time of outline generation;

an input step of entering designating information

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that designates a pattern to be generated and at the time of outline generation of the pattern;

an acquisition step, which is executed with regard to each control-point for forming the pattern designated
5 by said designating information, of acquiring the position of said each control-point that prevails when an outline is generated in the weight designated by the designating information, based upon the position information and movement information; and

10 an outline generating step of generating an outline of a pattern based upon the position of said each control-point acquired at said acquisition step.

15. The method according to claim 14, wherein:

said memory step stores, together with position
15 information of each control-point forming an outline of a prescribed thickness, and with regard to an control-point that moves in conformity with the weight of an output pattern, movement information relating to path of movement of this control-point and absence/presence
20 information indicating absence/presence of movement information at each control-point, these items of information being stored for each control-point; and

said acquisition step acquires, with regard to an control-point judged to have movement information from
25 said absence/presence information from among each of the control-points forming a pattern designated by said designating information, the position of said control-

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point, which prevails when the outline is generated in the weight designated by said designating information, based upon said position information and said movement information, and acquires, with regard to an control-point judged to have no movement information, position information of said control-point stored at said storing step, as the position of said control-point at the time of formation of a pattern outline.

16. The method according to claim 14, wherein:

said storing step stores, as movement information, and for each control-point, position information of each control-point forming an outline of a prescribed thickness and information for obtaining a function representing a path of movement of each control-point that accompanies a change in weight at the time of outline generation; and

said acquisition step acquires, with regard to each control-point of a pattern designated by said designating information, position at the time of outline generation at a weight designated by said designating information, this position being acquired using a function obtained based upon said position information and said movement information.

17. The method according to claim 14, wherein:

said storing step stores position information of each control-point forming an outline of a prescribed thickness and movement information for obtaining a

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function representing a path of movement of each control-point that accompanies a change in weight at the time of outline generation, these items of information being stored in variable length in dependence upon the degree of said function, and stores degree information, which represents the degree of said function, for each control-point; and

said acquisition step acquires, with regard to each control-point of a pattern designated by said designating information, position at the time of outline generation at a weight designated by said designating information, this position being acquired using a function obtained based upon said position information and said movement information.

18. The method according to claim 16, wherein:

said input step enters quality designating information, which is for designating quality at the time of formation of a pattern outline, together with said designating information; and

in a case where low quality is designated by said quality designating information, said acquisition step lowers the degree of the function representing the path of movement used, and acquires position information, which prevails at the time of outline generation, representing the position of the control-point at the time of outline generation.

19. The method according to claim 16, wherein:

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said input step has an input step of entering generation-speed designating information, which is for speed at the time of formation of a pattern outline, together with said designating information; and

5 in a case where high speed is designated by said generation-speed designating information, said acquiring step lowers the degree of the function representing the path of movement used, and acquires position information, which prevails at the time of outline
10 generation, representing the position of the control-point at the time of outline generation.

20. An outline forming method comprising:

a storing step of storing, with regard to each control-point for forming an outline of a pattern having
15 a prescribed weight, and for each control-point, position information based upon the position of each control-point, and storing a first standard width indicating a standard width of the pattern of said prescribed weight, and a second standard width
20 indicating a standard width of a pattern of an outline having maximum weight;

an input step of entering designating information that designates a pattern to be generated and weight at the time of outline generation of said pattern;

25 a setting step of performing ranking of amounts of movement, in which a difference between said first standard width and said second standard width serves as

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a reference, with regard to a movable amount of each control-point detected from a mutual positional relationship between control-points that form the pattern designated by said designating information, and
5 setting an amount-of-movement rank of each control-point;

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10 a generating step of generating, with regard to each control-point, movement information of said control-point based upon the amount-of-movement rank of the control-point and an amount-of-movement rank of an control-point of a pair that decides pattern width at the position of said control-point;

15 a acquisition step of acquiring, based upon said position information and said movement information, the position of said each control-point that prevails when an outline is generated in a thickness designated by said designating information; and

20 an outline generating step of generating an outline of a pattern based upon position at the time of outline generation acquired at said acquisition step.

21. The method according to claim 20, wherein said generating step obtains, with regard to said each control-point, the position of an control-point in a pattern of maximum weight based upon amount-of-movement
25 rank of the control-point and an amount-of-movement rank of an control-point of a pair that decides pattern width at the position of said control-point, and generates

movement information representing path of movement of said control-point, in which weight of the pattern serves as a parameter, based upon said position and said position information.

5 22. The method according to claim 20, wherein the pattern of the outline of a prescribed weight stored at said storing step is a pattern of an outline of maximum fineness.

23. The method according to claim 20, wherein said
10 storing step stores, with regard to each control-point for forming an outline of a pattern having a prescribed thickness, and for each control-point, position information based upon the position of an control-point, and stores a first standard width indicating a standard
15 width of the pattern of said prescribed thickness, and a second standard width indicating a standard width of a pattern of an outline having maximum fineness.

24. The method according to claim 23, wherein the pattern of the outline of a prescribed weight stored at
20 said storing step is a pattern of an outline of maximum weight.

25. The method according to claim 20, wherein said generating step has an amount-of-movement table storing a predetermined amount of movement for every combination
25 of amount-of-movement ranks, obtains an amount of movement of said control-point by searching said amount-of-movement table based upon a combination of the

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amount-of-movement rank of said control-point and an
amount-of-movement rank of an control-point of a pair
that decides pattern width at the position of said
control-point, and generates movement information of
5 said control-point based upon said amount of movement.

26. An outline forming method comprising:

a storing step of storing, with regard to each
control-point for forming an outline of a pattern having
a prescribed thickness, and for each control-point,
10 position information based upon the position of an
control-point and movement information based upon a path
of movement of the control-point that accompanies a
change in weight at the time of outline generation, and,
in a case where said movement information changes with a
15 certain weight serving as a boundary, storing weight
information indicating a weight which serves as the
boundary and movement information after the change;

an input step of entering designating information
that designates a pattern to be generated and weight at
20 the time of outline generation of said pattern;

a selecting step of selecting, with regard to each
control-point that forms the pattern designated by said
designating information, selects movement information to
be used based upon the thickness designated by said
25 designating information and said weight information;

an acquisition step which, with regard to said each
control-point, is for acquiring the position of said

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each control-point that prevails when an outline is generated in the weight designated by said designating information, based upon said position information and the movement information selected at said selecting step; and

an outline generating step of generating an outline of a pattern based upon position at the time of outline generation acquired at said acquisition step.

27. An outline-data storing apparatus comprising:

first memory means for storing outline data having position information of each control-point corresponding to a prescribed weight as well as weight information indicating this weight;

generating means for generating movement information, which is for moving the position of an control-point in correspondence with a change in weight of an outline pattern to be generated, based upon said outline data; and

second memory means for storing the movement information, which is generated by said generating means, along with the position information of each control-point.

28. The apparatus according to claim 27, wherein:

said first memory means stores, with regard to at least two types of weights, outline data having position information of each control-point corresponding to the prescribed weight and weight information indicating said

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weight; and

5 said generating means generates, for each control-point, movement information for obtaining path of movement, in which thickness serves as a parameter, based upon position information and weight information of each control-point in outline data of plural types of weight stored by said first memory means.

29. The apparatus according to claim 27, wherein:

10 said first memory means stores, with regard to n types of weights, outline data having position information of each control-point corresponding to the prescribed weight and weight information indicating said weight; and

15 said generating means generates, for each control-point, and as movement information, data for obtaining a function of an $(n-1)$ th degree as path of movement, in which weight serves as a parameter, based upon position information and weight information of each control-point in n types of outline data stored by said first memory means.

20 30. The apparatus according to claim 29, wherein said second memory means stores the movement information generated by said generating means on a storage medium together with the position information of each control-point, and stores the degree of a function obtained by

25 the movement information generated by said generating means.

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31. The apparatus according to claim 27, further comprising discriminating means for detecting an amount each control-point is capable of moving in conformity with a change in thickness based upon the outline data in said first memory means, and discriminating an amount-of-movement rank of each control-point;

5 said generating means generating movement information, which is for moving the position of an control-point in conformity with a change in weight, based upon said outline data and said amount-of-movement rank.

32. The apparatus according to claim 31, further comprising:

15 extracting means which, with regard to a certain control-point in said outline data in said first memory means, extracts an control-point that forms a pair with said control-point and decides the width of an outline pattern;

20 said generating means generating movement information, which is for moving the position of each control-point in conformity with a change in weight, based upon said outline data, the amount-of-movement rank of each control-point and an amount-of-movement rank of the control-point forming the pair with said control-point extracted by said extracting means.

25 33. The apparatus according to claim 32, further comprising:

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third memory means for storing an amount-of-movement table in which are registered predetermined amounts of movement in correspondence with combinations of amount-of-movement ranks of control-points and
5 amount-of-movement ranks of control-points forming pairs with these control-points;

said generating means generating movement information, which is for moving the position of an control-point in conformity with a change in weight,
10 based upon an amount of movement obtained by searching said third memory means on the basis of a combination of the amount-of-movement rank of each control-point discriminated by said discriminating means and the amount-of-movement rank of the control-point forming a
15 pair with said control-point extracted by said extracting means.

34. The apparatus according to claim 33, wherein said third memory means stores a plurality of types of amount-of-movement tables of different detail of
20 classification of amount-of-movement ranks in said amount-of-movement table, said apparatus further comprising:

input means for entering designating information that designates one amount-of-movement table from said
25 third memory means;

said generating means generating movement information, which is for moving the position of an

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control-point in conformity with a change in weight,
based upon an amount of movement obtained by searching
an amount-of-movement table designated by said
designating information on the basis of a combination of
5 the amount-of-movement rank of each control-point
discriminated by said discriminating means and the
amount-of-movement rank of the control-point forming a
pair with said control-point extracted by said
extracting means.

10 35. An outline-data storing method comprising:

a first storing step of storing outline data having
position information of each control-point corresponding
to a prescribed weight as well as weight information
indicating this weight;

15 a generating step of generating movement
information, which is for moving the position of an
control-point in correspondence with a change in weight
of an outline pattern to be generated, based upon said
outline data; and

20 a second storing step of storing the movement
information, which is generated at said generating step,
along with the position information of each control-
point.

36. The method according to claim 35, wherein:

25 said first storing step stores, with regard to at
least two types of weight, outline data having position
information of each control-point corresponding to the

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prescribed weight and weight information indicating said weight; and

5 said generating step generates, for each control-point, movement information for obtaining path of movement, in which thickness serves as a parameter, based upon position information and weight information of each control-point in outline data of plural types of weight stored at said first storing step.

37. The method according to claim 35, wherein:

10 said first storing step stores, with regard to n types of weight, outline data having position information of each control-point corresponding to the prescribed weight and weight information indicating said weight; and

15 said generating step generates, for each control-point, and as movement information, data for obtaining a function of an $(n-1)$ th degree as path of movement, in which weight serves as a parameter, based upon position information and weight information of each control-point
20 in n types of outline data stored at said first storing step.

38. The method according to claim 37, wherein said second storing step stores the movement information generated at said generating step on a storage medium
25 together with the position information of each control-point, and stores the degree of a function obtained by the movement information generated at said generating

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step.

39. The method according to claim 35, further comprising a discriminating step of detecting an amount each control-point is capable of moving in conformity
5 with a change in thickness based upon the outline data stored at said first storing step and discriminating an amount-of-movement rank of each control-point;

said generating step generating movement information, which is for moving the position of an
10 control-point in conformity with a change in weight, based upon said outline data and said amount-of-movement rank.

40. The method according to claim 35, further comprising:

15 an extracting step which, with regard to a certain control-point in said outline data stored at said first storing step, extracts an control-point that forms a pair with said control-point and decides the width of an outline pattern;

20 said generating step generating movement information, which is for moving the position of each control-point in conformity with a change in weight, based upon said outline data, the amount-of-movement rank of each control-point and an amount-of-movement
25 rank of the control-point forming the pair with said control-point extracted at said extracting step.

41. The method according to claim 40, further

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comprising:

5 a third storing step of storing an amount-of-movement table in which are registered predetermined amounts of movement in correspondence with combinations of amount-of-movement ranks of control-points and amount-of-movement ranks of control-points forming pairs with these control-points;

10 said generating step generating movement information, which is for moving the position of an control-point in conformity with a change in weight, based upon an amount of movement obtained by searching said third storing step on the basis of a combination of the amount-of-movement rank of each control-point discriminated at said discriminating step and the
15 amount-of-movement rank of the control-point forming a pair with said control-point extracted at said extracting step.

20 42. The method according to claim 41, wherein said third storing step stores a plurality of types of amount-of-movement tables of different detail of classification of amount-of-movement ranks in said amount-of-movement table, said method further comprising:

25 an input step of entering designating information that designates one amount-of-movement table from the amount-of-movement tables stored at said third storing step;

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5 said generating step generating movement
information, which is for moving the position of an
control-point in conformity with a change in weight,
based upon an amount of movement obtained by searching
an amount-of-movement table designated by said
designating information on the basis of a combination of
the amount-of-movement rank of each control-point
discriminated at said discriminating step and the
amount-of-movement rank of the control-point forming a
10 pair with said control-point extracted at said
extracting step.

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